

论文

LY12铝合金表面电化学沉积制备DTMS硅烷膜及其耐蚀性研究

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摘要:

采用电化学技术在LY12铝合金表面沉积制备了十二烷基三甲氧基硅烷(DTMS)膜. 反射吸收红外光谱表明, DTMS硅烷试剂与铝合金基体表面发生了化学键合作用, 生成—SiOAl键实现成膜. 通过对膜覆盖电极在质量分数为3.5%的NaCl溶液中的电化学阻抗谱(EIS)测试结果表明, 与开路电位下相比, 采用阴极电位沉积方法得到硅烷膜的耐蚀性能有明显提高, 且存在一个最佳“临界电位”, 在此电位下沉积得到的硅烷膜具有最高的耐蚀性. 扫描电镜观察结果表明, 在“临界电位”下制备得到的硅烷膜的结构最致密. 给出了硅烷膜覆盖电极的阻抗模型及相关参数的拟合结果.

关键词: 硅烷化处理 电化学沉积 DTMS LY12铝合金 防腐蚀

Preparation of DTMS Films on LY12 Aluminum Alloys via Electrochemical Deposition and Their Anti-corrosive Performance

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Abstract:

Dodecyltrimethoxysilane(DTMS) films were prepared on LY12 aluminum alloys by electrochemical deposition. FTIR-RA tests showed that the DTMS films were successfully deposited through the chemical bonding between silane agent and Al alloys, i.e., by the formation of Si—O—Al bond. The corrosion inhibition of silane covered alloys was characterized by electrochemical impedance spectroscopy(EIS) measurements in NaCl solutions with a mass fraction of 3.5%. The results show that in comparison with those prepared at open-circuit potential(OCP), the DTMS films deposited at cathodic potentials displayed an enhancement in protectiveness. Furthermore, a “critical potential” were observed, at which the films prepared showed the highest barrier performance. Scanning electron microscopy(SEM) image indicated a potential dependence of surface morphology of silane films. The highest compactness was obtained at the “critical potential”. The impedance models of DTMS covered Al alloys in corrosive solutions were also proposed in the present work.

Keywords: Silane treatment Electrochemical deposition Dodecyltrimethoxysilane(DTMS) LY12 aluminum alloy Corrosion protection

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